Ute Indian Tribe's Air Program

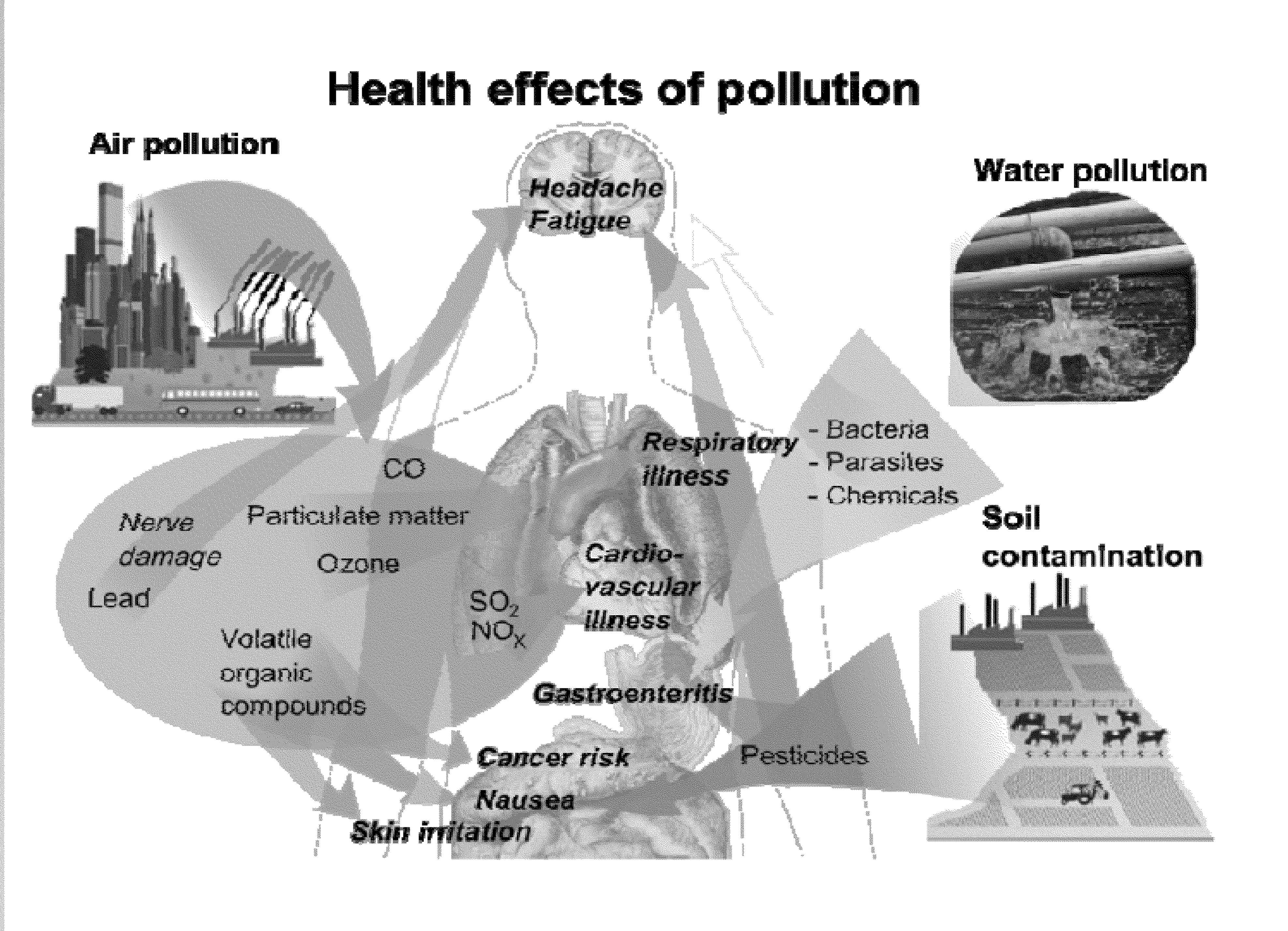
Clean Air Act Ozone 101

What We Will Cover

- Health effects of air pollution
- Current ozone design values and regulatory monitors
- Timeline of the designation process
- Implications of different classifications (what's involved in SIP/FIP, demonstrating attainment)
- Definition of Uinta Basin airshed for designation purposes
- Winter ozone field studies
- Ozone modeling for NAAQS attainment
- Uinta Basin modeling currently available
- Background ozone
- Where are the emissions coming from?
- VOC and NOx emissions on the Uintah & Ouray Indian Reservation

Types of Air Pollution That Cause Health Effects:

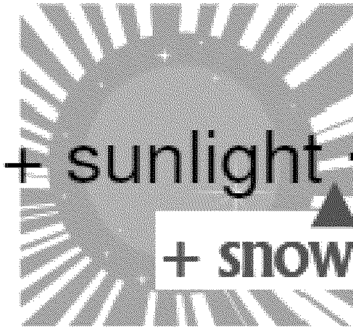
- Ozone (revised 70 ppb standard)
- Regional haze – impacting visibility in Class I areas
- Nitrogen deposition – Class I areas
- Air Toxics – aka HAPs Hazardous Air Pollutants
- Greenhouse Gas (GHG) emissions



2016-008149-0035779

Ozone

Good Up High
Bad Nearby



NOx + VOC + sunlight → ground-level ozone

+ snow cover

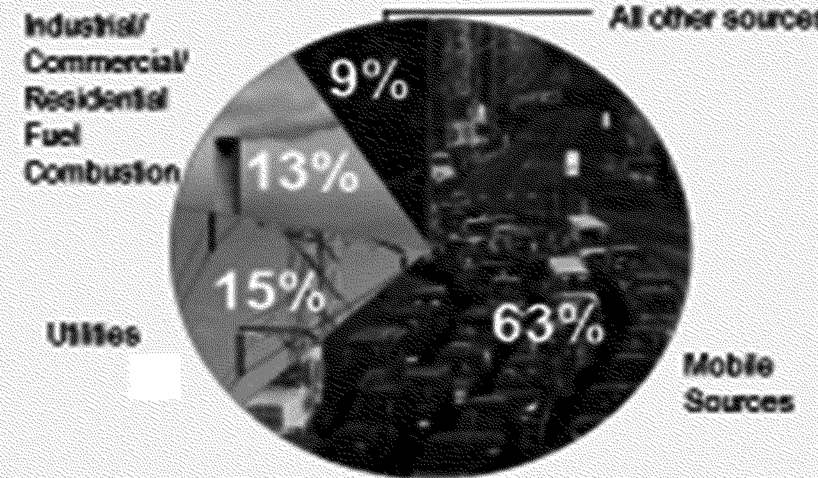
Health problems from breathing ozone

- Chest pain, shortness of breath
- Coughing & sore, scratchy throat
- Inflame & damage the airways
- Worsen asthma, bronchitis, emphysema
- Increase the frequency of asthma attacks
- Reduce lung function and inflame the linings of the lungs
- Repeated exposure may permanently scar lung tissue

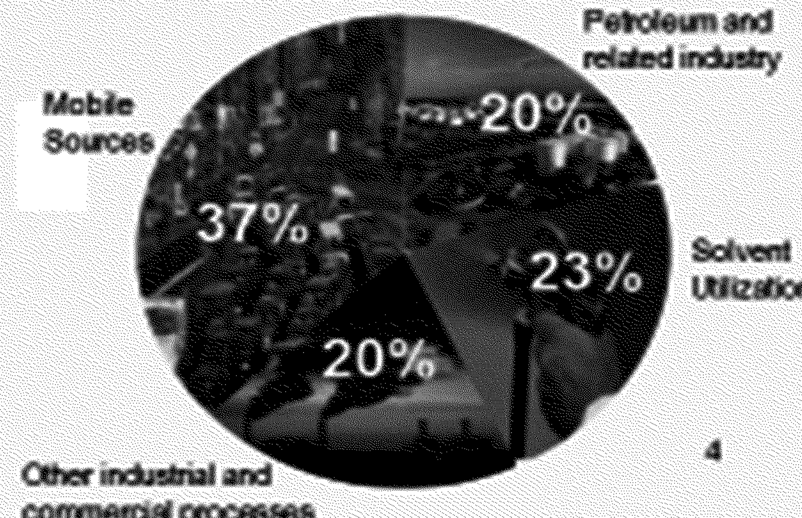
About Ground-Level Ozone

- Ozone is the main component of smog.
- It is not emitted directly into the air but forms when emissions of precursors, including nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide and methane "cook" in the sun.
- Emissions from industrial facilities, electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are the major man-made sources of NOx and VOCs.

Sources of NOx



Sources of VOC



Source: EPA, 2011 National Emissions Inventory v1 - [illegible]

Ozone Monitors

Regulatory Monitor Status

- Regulatory data is collected under an approved Quality Assurance Project Plan and in compliance with 40 CFR Parts 50 and 58
- Since 2009, Uinta Basin ozone monitors have been operated by Industry, the Ute Indian Tribe, Utah DEQ, National Park Service, and EPA contractors
- Regulatory status of monitors operated by each agency have changed over time
  - Utah DEQ: All Data (Roosevelt, Fruitland, Vernal) Regulatory 2012-2016
  - Ute Indian Tribe: 2011, 2014-2016 are regulatory
  - Industry/Contractors: 2013-2014 was regulatory
  - National Park Service: Rangely, all is regulatory; Dinosaur NM is regulatory after Jan. 2014

Ozone NAAQS and Three Year Design Value

- The 2015 ozone NAAQS is attained when the three year average of annual 4^{th} highest daily 8-hour average is less than or equal to 0.070 ppm (or 70 ppb)
- Example for Ouray:

Year	4^{th} high Regulatory 8-hour Average
2013	0.092 ppm
2014	0.079 ppm
2015	0.068 ppm
'13-'15 Three year average of 4^{th} highs	0.079 ppm

Ozone NAAQS and Three Year Design Value

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- Example for Ouray:

	2013	2014	2015	Design Value
1st	0.095	0.091	0.071	
2nd	0.094	0.088	0.071	
3rd	0.093	0.083	0.069	
4th	0.092	0.079	0.068 avg.▶	0.079

Current Ozone Design Values from Regulatory Monitors (based on preliminary 2013-2015 data) 2015 Ozone NAAQS: 70 ppb

Monitor	Regulatory DV
Myton	74
Whiterocks	68
Redwash	73
Ouray	79
Roosevelt	76
Rangely, CO	73
Meeker, CO	63

The design value is the 3-year average of the annual 4th highest daily maximum 8-hour ozone concentration.

2016 Uinta Basin Ozone Exceedances to date (ppb)						
Monitor	Ouray	Myton	Redwash	Whiterocl	Roosevelt	Dinosaur N
Operator	Tribal	Tribal	Tribal	Tribal	Utah DEQ	NPS
1/28/2016	73	69	62	67	73	61
1/29/2016	79	56	72	64	74	65
2/7/2016	86	74	70	73	83	64
2/8/2016	94	74	73	81	84	67
2/9/2016	94	77	83	78	71	71
2/10/2016	101	85	83	81	88	75
2/11/2016	96	85	94	85	81	77
2/12/2016	120	92	96	86	94	80
2/13/2016	107	95	87	80	96	83
2/14/2016	85	61	56	66	71	67
2/15/2016	71	41	40	45	46	48
2/16/2016	66	48	46	46	46	44

Site	Preliminary 2016 4th High	2014-2016 Prelim. DV
Ouray	96 ppb	81.0 ppb
Myton	85 ppb	72.7 ppb
Whiterocks	81 ppb	71.0 ppb
Redwash	83 ppb	71.0 ppb
Roosevelt	84 ppb	68.7 ppb
Dinosaur NM	75 ppb	69.3 ppb
Rangely, CO	59 ppb	62.3 ppb

Ozone Design Value Classifications

Nonattainment Designation Classification	Design Value (ppb)	
	Current 75 ppb Ozone NAAQS	70 ppb Ozone NAAQS (Estimated)
Marginal	76 - <86	71 - <80
Moderate	86 - <100	80 - <93
Serious	100 - <113	93 - <105
Severe	113 - <119	105 - <111
Extreme	119 - <175	111 - <163

Timeline of the Designations and Implementation Process

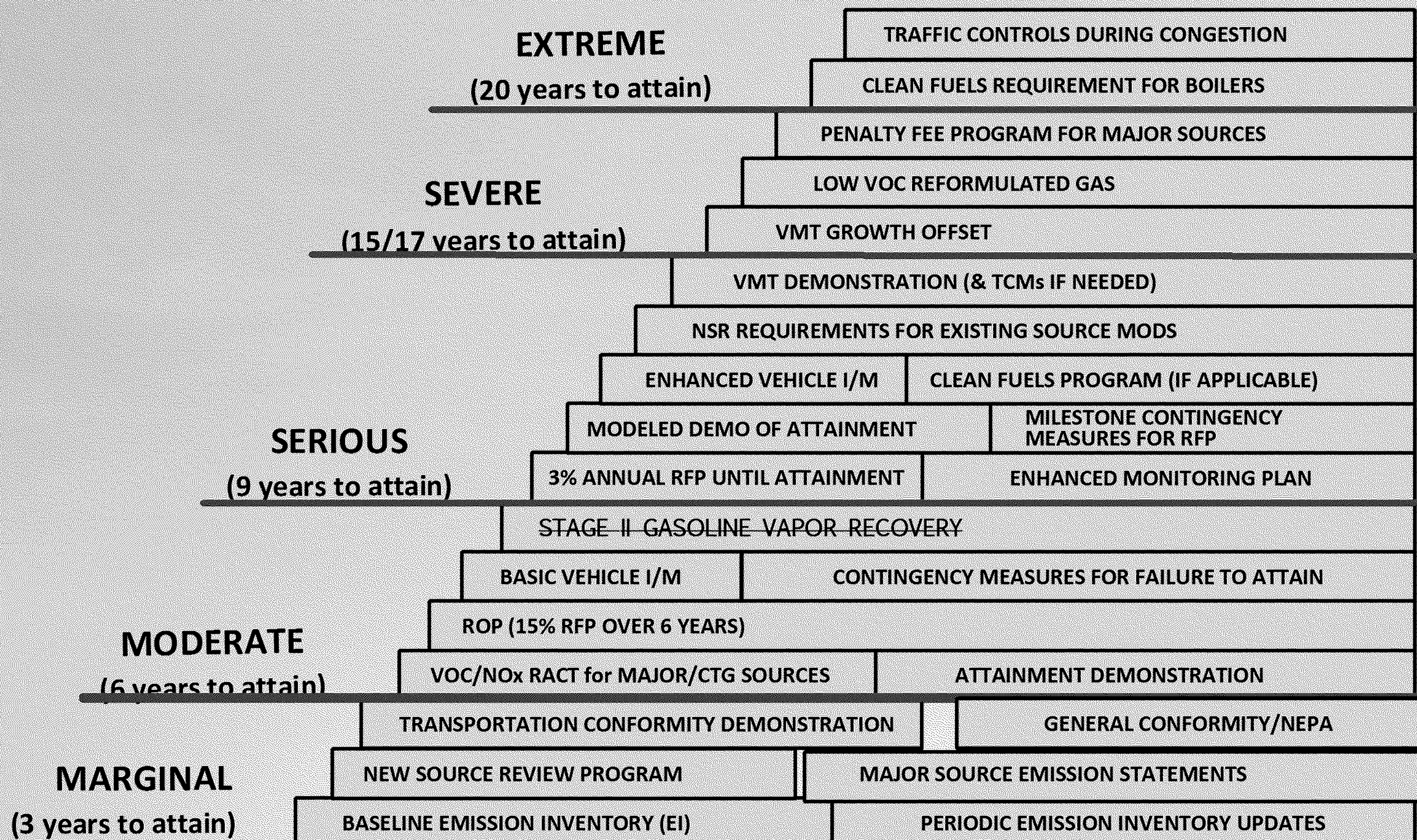
State and Tribe Recommendations	Within 1 year after NAAQS promulgation	October 1, 2016 (Air quality data years 2013-2015, and preliminary 2016)
EPA responds to state and tribal recommendations (120-day letters)		June 1, 2017 (Air quality data years 2014-2016)
Final Designations	Within 2 years after NAAQS promulgation (Administrator has discretion to extend the deadline by one year to collect sufficient information)	October 1, 2017 Effective date may vary (Air quality data years 2014-2016)
Infrastructure SIP (outlines the state's air quality mgt. program such as monitoring and enforcement)	Within three years after NAAQS promulgation	October 2018
Attainment Plans Due	Within 36-48 months after designations depending on classification	October 2020-2021

Attainment Schedule by Classification

Classification	Schedule*
Marginal	3 years to attain
Moderate	6 years to attain
Serious	9 years to attain
Severe	15-17 years to attain
Extreme	20 years to attain

* Areas must attain as expeditiously as practical, but not later than the schedule in the table. Two one-year extensions are available in certain circumstances based on air quality. The schedule is pegged to the origin date of designation.

Overview of CAA Ozone Nonattainment Area Planning & Control Mandates by Classification



NSR offset ratio	Major source threshold
1.5 : 1 Extreme	10
1.3 : 1 Severe	25
1.2 : 1 Serious	50
1.15 : 1 Moderate	100
1.1 : 1 Marginal	100

Nonattainment Area Boundary Determination

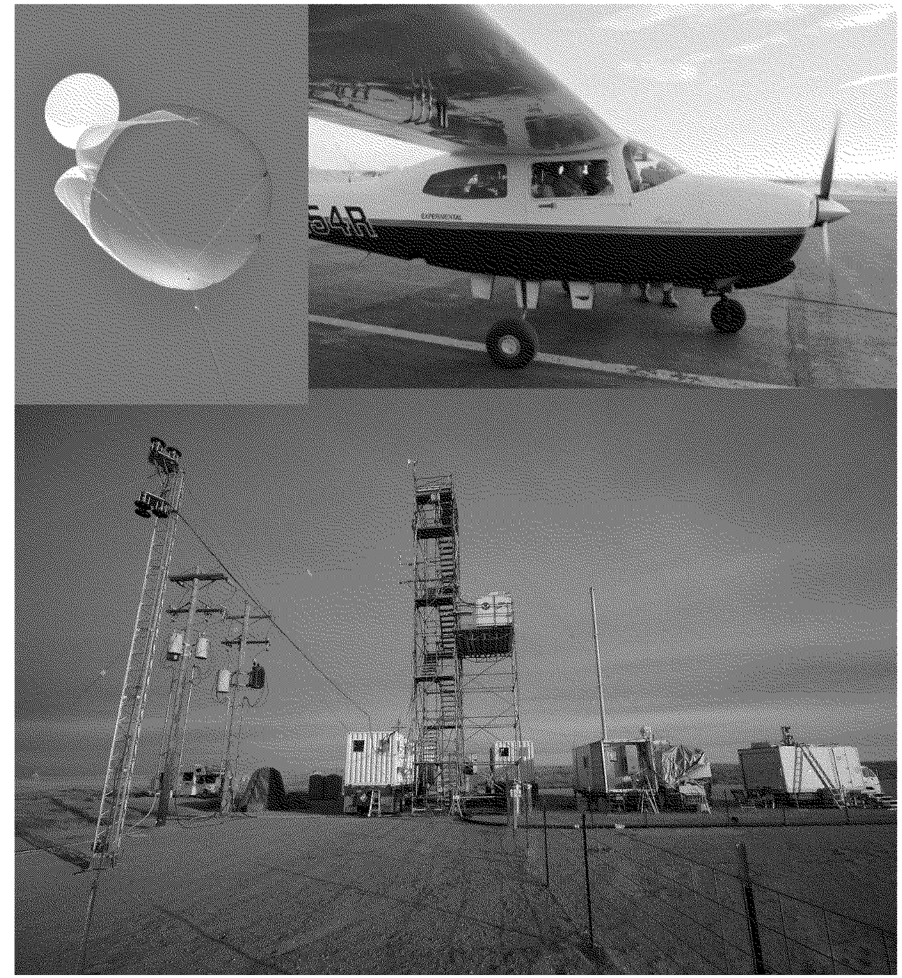
- The boundary of the non-attainment area is proposed by the state (or tribe)
  - Those recommendations are then used by EPA in the final designation process
- EPA recommends that states/tribes consider five factors
  1. Air quality data
  2. Emissions and emissions related data
  3. Meteorology
  4. Geography/Topography
  5. Jurisdictional boundaries
- May or may not follow Metropolitan Statistical Areas/Combined Statistical Area boundaries
- Boundary may include partial counties

Nonattainment Area Boundary Determination

- Boundary determinations must include not only the area that is violating, but also nearby areas that contribute to the violation
- Tribes may recommend that the EPA designate areas of Indian country separately from the adjacent state areas.
  - December 20, 2011:"Policy for Establishing Separate Air Quality Designations for Areas of Indian Country" http://www3.epa.gov/air/tribal/pdfs/0067_001.pdf
- The combination of all factors represents a "weight-of-evidence" regarding the most appropriate boundary for the nonattainment area

Uinta Basin Winter Ozone Field Studies

- Utah State University (USU) performed the first distributed ozone monitoring study in winter 2011. Very few measurements of precursors.
- WEA, UDEQ, EPA, NOAA and university researchers collaborated on major field studies in 2012, 2013, and 2014.
- Studies found that high ozone occurs in a shallow surface layer during strong inversion conditions with snow cover.
- VOC and NOx emissions from oil and gas development are the largest sources that contribute to winter ozone.
- Models simulations indicate that ozone is more sensitive to reductions in VOC



Ozone modeling for NAAQS Attainment

- Areas that violate the ozone NAAQS at a level of "moderate" or greater are required to develop an air quality modeling ozone attainment demonstration as part of their SIP or TIP:
  - The modeling system includes emissions data, meteorological modeling and a photochemical air quality model, usually CMAQ or CAMx.
  - The modeling system is evaluated for historical episodes, and if the model performs well, it is used to evaluate the emissions control strategies needed to attain the NAAQS.
  - Model sensitivity and source apportionment simulations can be used to identify the sources that contribute most to ozone and to evaluate control scenarios.
- Models are also used to evaluate interstate transport contributions to ozone monitors that violate the NAAQS. If the transport contribution exceeds a threshold, infrastructure SIPs (or TIPs/FIPs) must demonstrate plans to address transported ozone in downwind

Modeling currently available for the Uinta Basin

- Air Resource Management Strategy (ARMS) for 2010 using CMAQ and CAMx at a 4 km resolution. Completed in 2013 and was based on the 2008 NEI(?)
- Western Air Quality study for 2011 includes CMAQ and CAMx simulations at 4 km resolution. Completed in 2016, based on the 2011 NEI with updates developed for some emissions source sectors.
- EPA transport modeling for 2011 used CAMx at a 12 km resolution to evaluate ozone contributions to downwind states.
- NOAA performed WRF-Chem model simulation for the Uinta Basin using emissions based on the 2011 NEI.
- Utah DEQ and EPA have also performed CMAQ model simulations for 2013 using emissions based on the 2011 NEI.
- All model simulations to date have been biased low for VOC and ozone in the Uinta Basin, and large increases in the modeled oil and gas VOC emissions were necessary to improve model performance.

Uncertainty in Oil and Gas Emissions

- NOAA modeling estimate of VOC emissions is two times higher than NEI VOC emissions.
- EPA model simulations of individual VOC species are biased low by a factor of five compared to observations for some the highest reactivity components of VOC, including formaldehyde, toluene and xylene.
- Emissions sources of formaldehyde include engines, combustion sources and methanol used as a de-icing agent.
- The high reactivity VOC species are also of interest because they are hazardous air pollutants. Sources include glycol dehydrators, tanks and evaporation ponds.
- Utah DEQ, EPA, WRAP and WEA are working to develop improved emissions data.

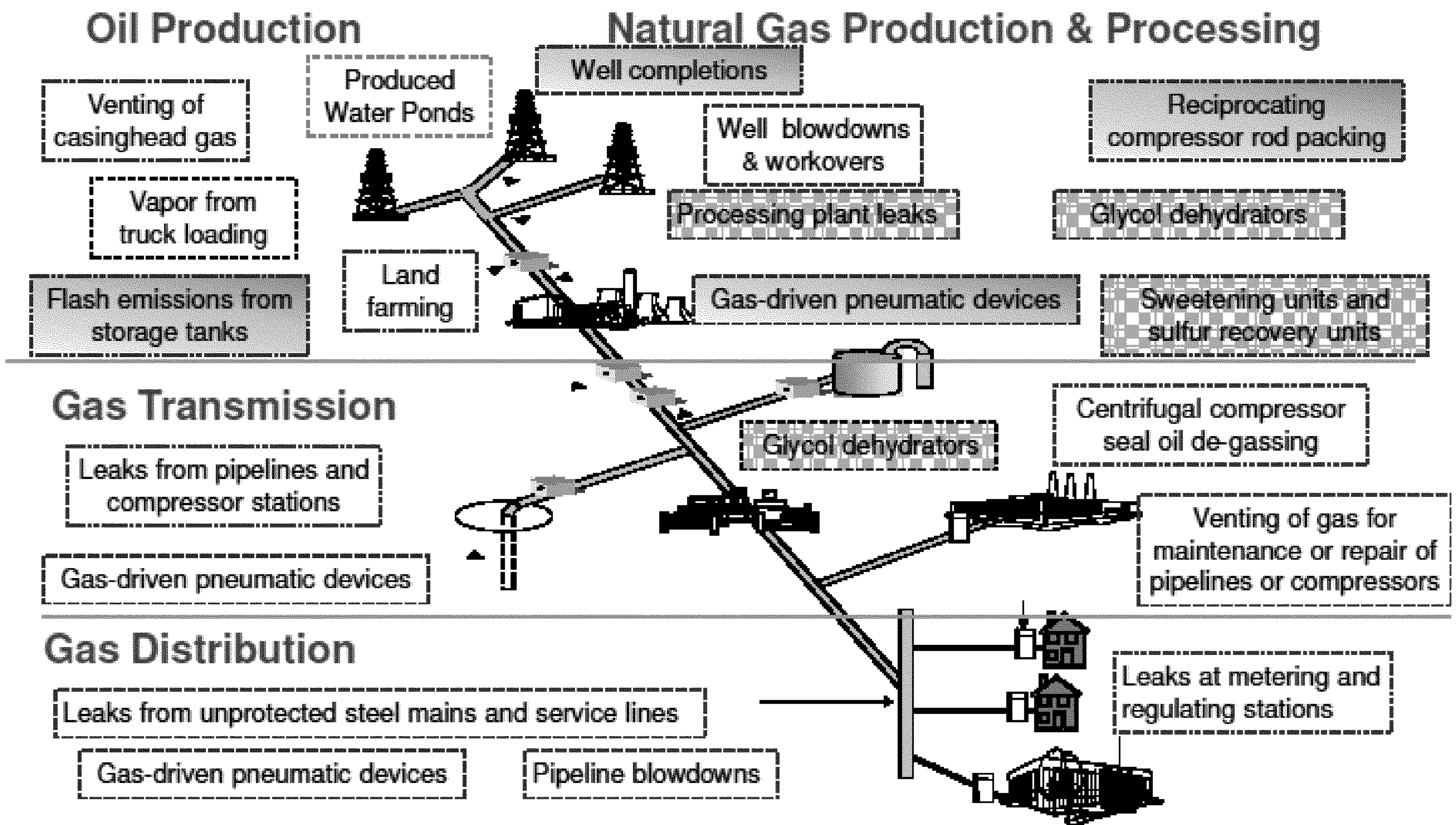
Background ozone

- EPA and other modeling studies have found high levels of background ozone during spring and summer in the western US.
  - High background levels can result from a combination of natural precursor emissions, international and interstate transport, and transport from the stratosphere.
  - High contributions from background ozone occur during spring and summer under well ventilated conditions with transport from the free troposphere to the surface.
- High background ozone is not a concern for winter ozone in UT and WY:
  - There is very little contribution from transport during persistent cold air pool inversion events. Instead, ozone and precursors accumulate in a shallow surface later under stagnant air conditions.
  - Background ozone levels during winter ozone events are relatively low, typically between 35 to 45 ppb.

Resources

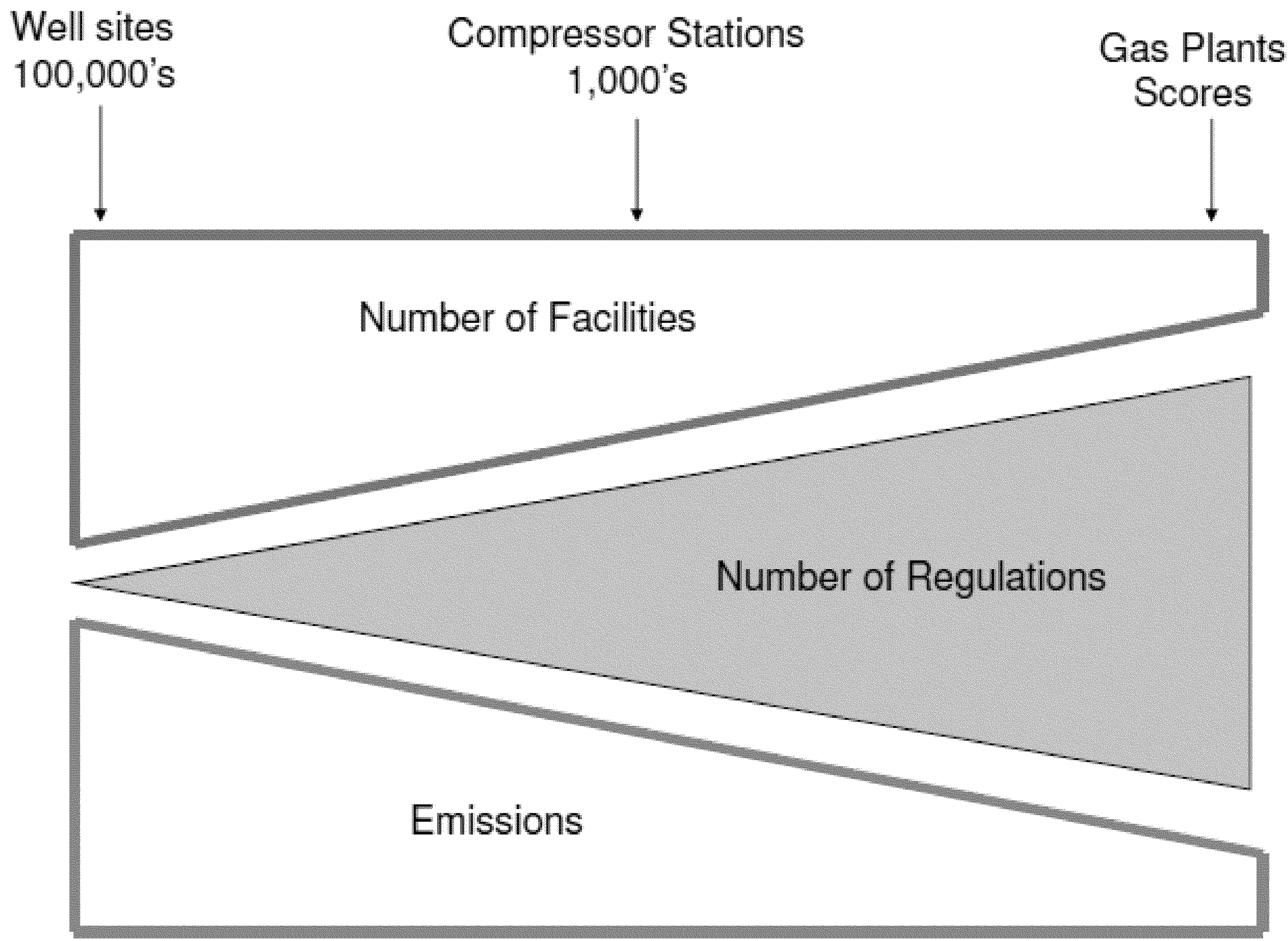
- EPA Guidance on the Area Designations for the 2015 Ozone NAAQS (i.e. 70 ppb) https://www.epa.gov/ozone-designations/epa-guidance-area-designations-2015-ozone-naaqs
  States and Tribes should refer to this guidance for area designations for the 2015 Ozone NAAQS when preparing their recommendations on area designations

Where are the oil and gas emissions coming from?

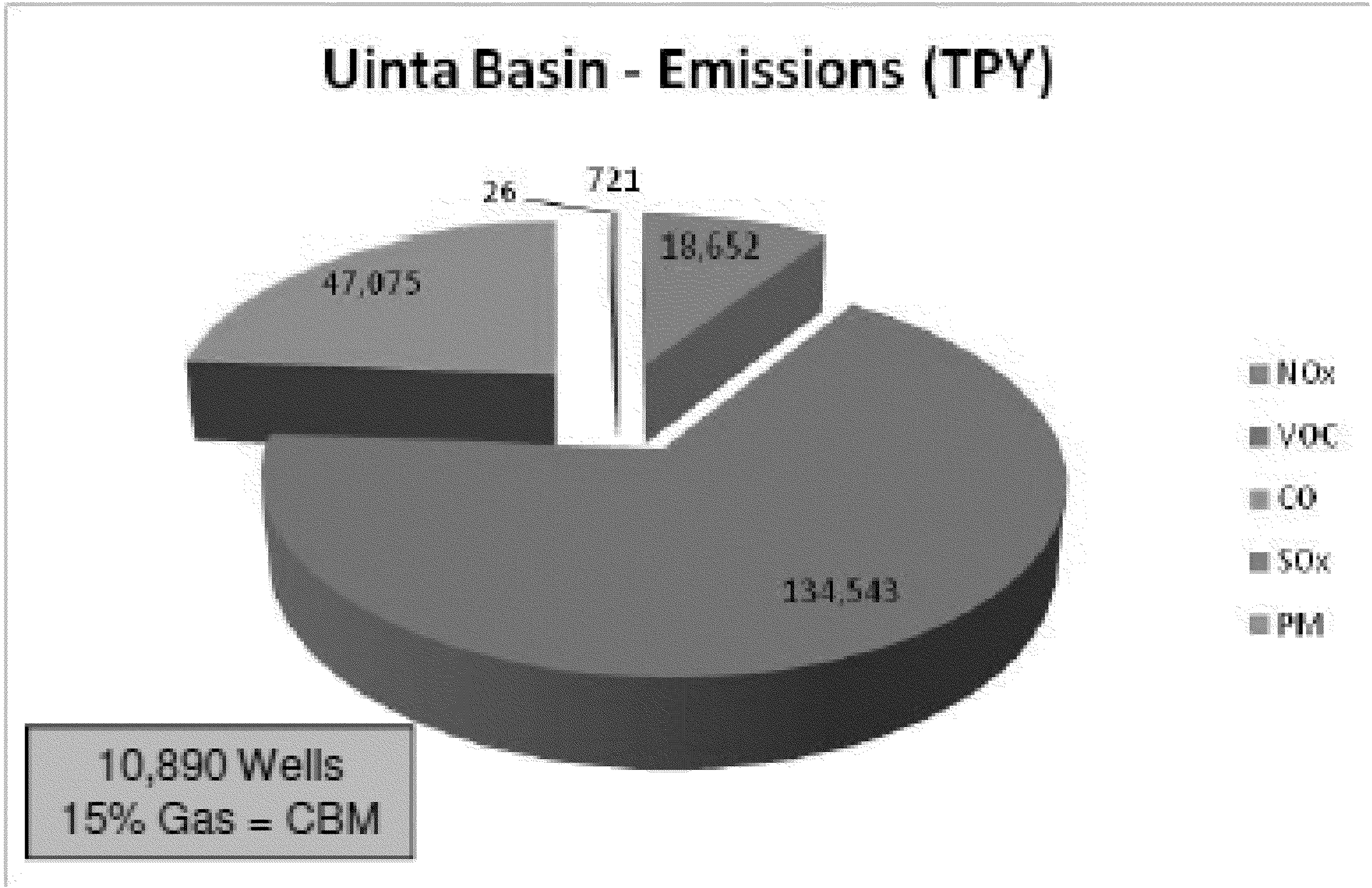


Slide courtesy of American Gas Association and Office of Atmospheric Programs

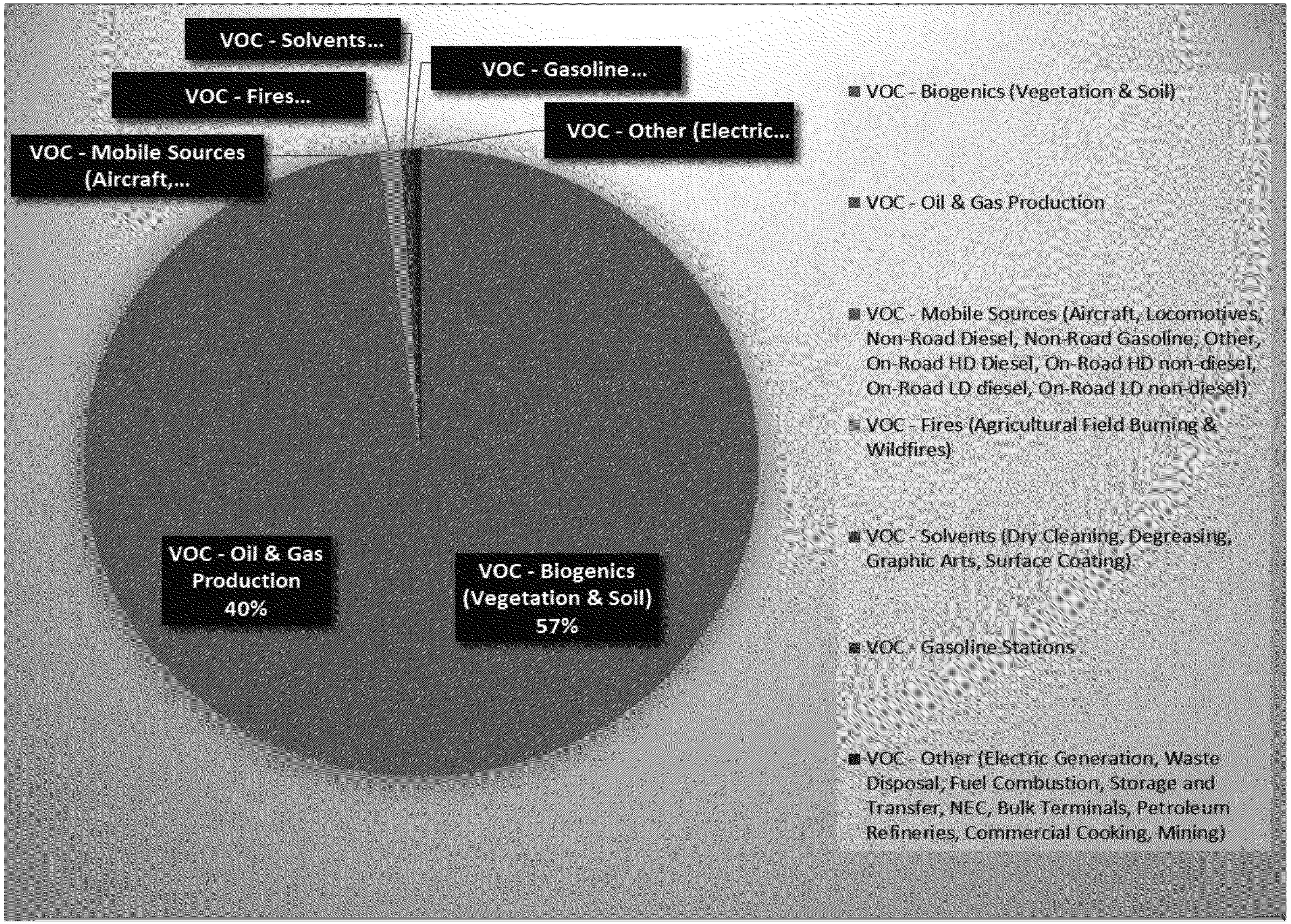
NOTE: Shaded boxes denote emission sources at least partially covered by existing rules


Well sites
100,000's
Compressor Stations
1,000's
Gas Plants
Scores
Number of Facilities
Number of Regulations
Emissions

Western Regional Air Partnership Phase III Emission Inventory

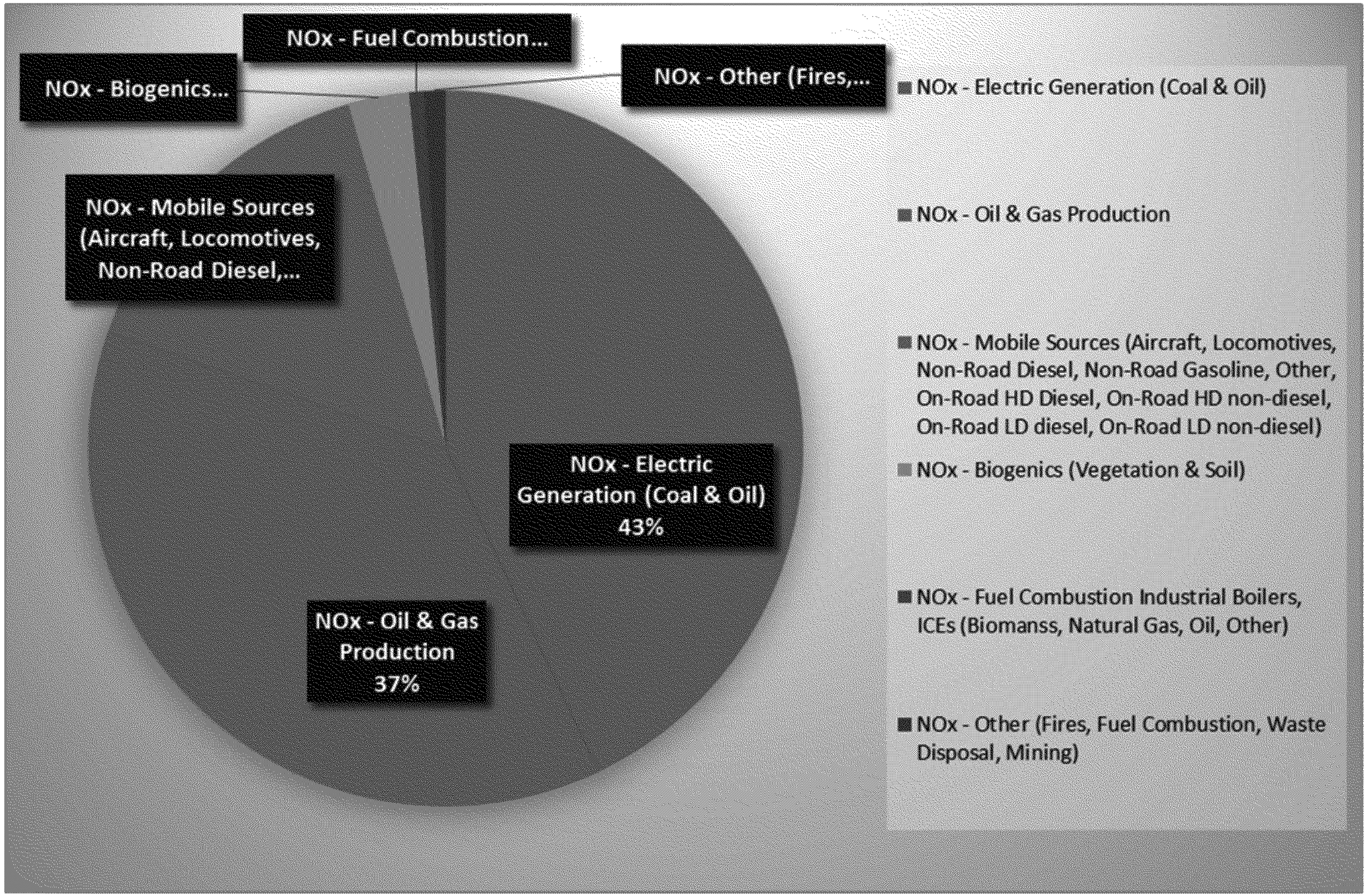


VOC emissions totals by source sector in the Uinta Basin based on estimates in the 2011 National Emissions Inventory



Source: 2011 National Emissions Inventory, available online at http://www3.epa.gov/ttn/chief/net/2011inventory.html, accessed December 4, 2015.

NOx emissions totals by source sector in the Uinta Basin based on estimates in the 2011 National Emissions Inventory



Source: 2011 National Emissions Inventory, available online at http://www3.epa.gov/ttn/chief/net/2011inventory.html, accessed December 4, 2015

VOC and NOx Emissions on U&O Reservation

Facility Type	# Facilities	VOC (TPY)	% of Total	NOx (TPY)	% of Total
Existing Permitted Facilities (Major PSD, synthetic minor NSR, and/or Title V)	19	1,053	1.6%	5,258	32%
Existing Minor Oil and Natural Gas Production Facilities	5,169	63,140	98%	11,168	68%
Existing Minor Nonmetallic Mineral Mining Facilities	1	9	0.01%	3	0.02%
TOTAL	**5,189**	**64,202**		**16,429**	

Source: Data submitted by operators of sources on the Indian country lands within the U&O Reservation either through existing permits/emissions inventories/applications, or from existing minor source registration reports submitted under 40 CFR 49.160 of the Federal Indian Country Minor NSR Program.

WRAP Phase III Emission Inventory – Uinta Basin

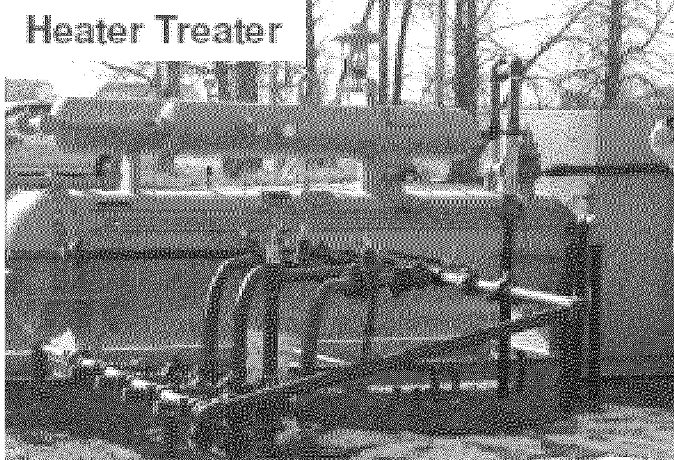
Description	2012 Emissions				
	NOx (tons/year)	VOC (tons/year)	CO (tons/year)	SOx (tons/year)	PM10 (tons/year)
Dehydrator	225	30,665	189	0	17
Pneumatic devices	0	25,083	0	0	0
Condensate tank	0	21,719	0	0	0
Oil Tank	0	20,722	0	0	0
Pneumatic pumps	0	14,322	0	0	0
Permitted Sources	3,184	4,355	2,517	8	48
Unpermitted Fugitives	0	3,212	0	0	0
Truck Loading of Oil	0	1,391	0	0	0
Venting - Compressor Startup	0	1,300	0	0	0
Venting - Compressor Shutdown	0	1,233	0	0	0
Artificial Lift	3,053	955	34,750	2	136
Compressor engines	3,169	695	4,236	0	46
Venting - blowdowns	0	460	0	0	0
Truck Loading of Condensate	0	445	0	0	0
Drill rigs	4,773	362	1,507	3	236
Venting - initial completions	0	332	0	0	0
Heaters	1,671	95	1,420	11	132
Miscellaneous engines	199	63	201	0	1
Venting - recompletions	0	51	0	0	0
Workover rigs	271	22	91	0	15
Gas Plant Truck Loading	0	12	0	0	0
Condensate tank flaring	2	0	9	0	0
Dehydrator Flaring	0	0	1	0	0
Initial completion Flaring	1	0	4	0	0
Total	**16,547**	**127,495**	**44,925**	**24**	**631**

Wellfield

Wellsite Facility

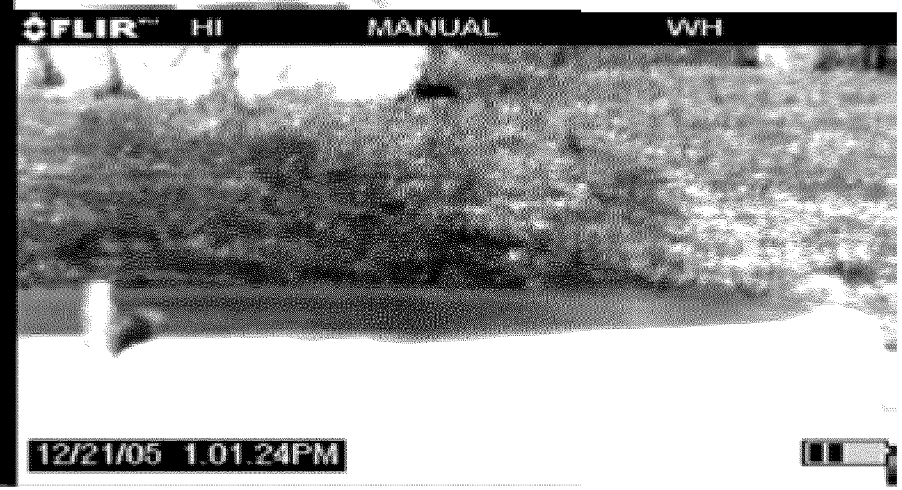
State Regs

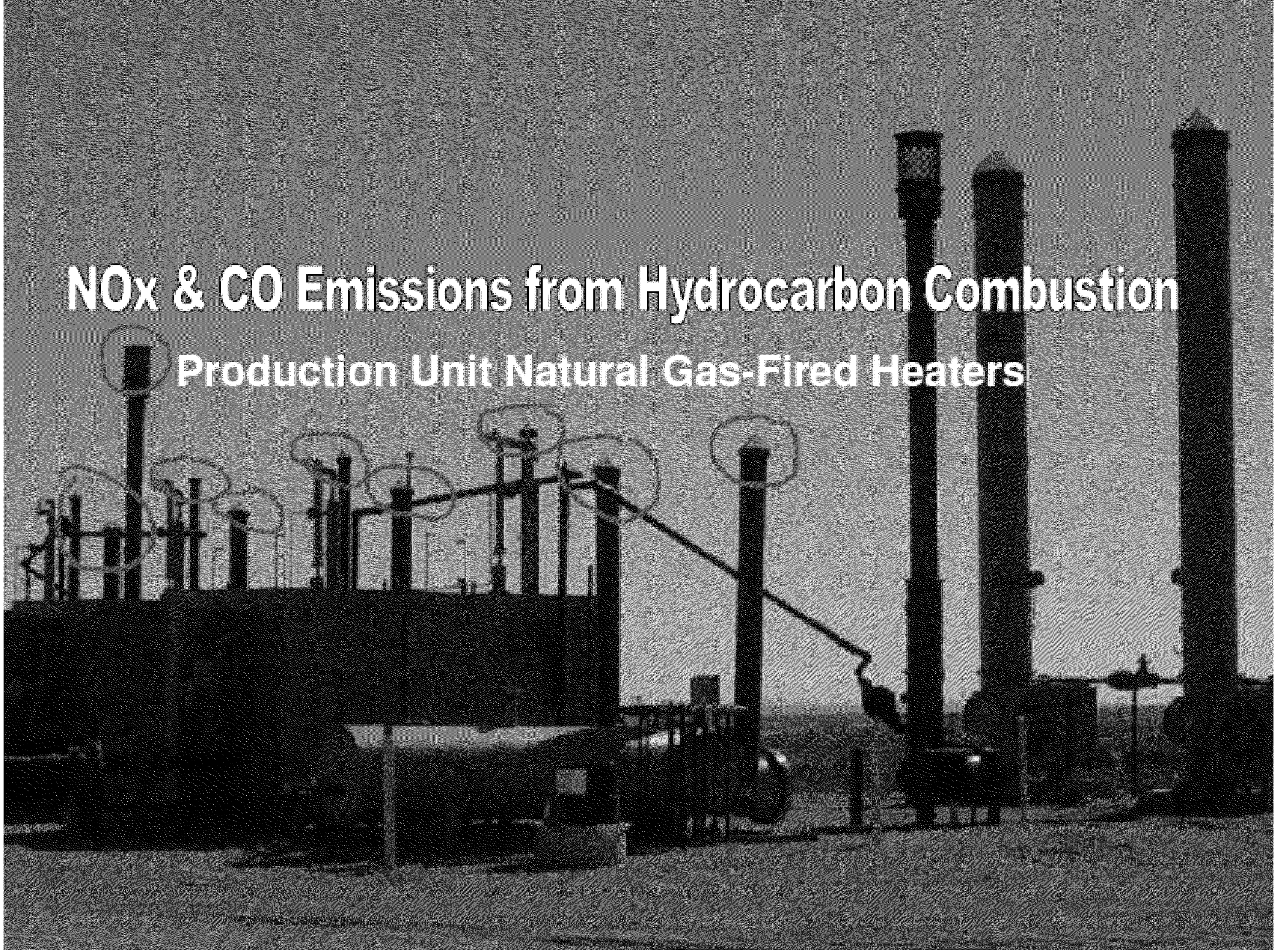
Heater Treater

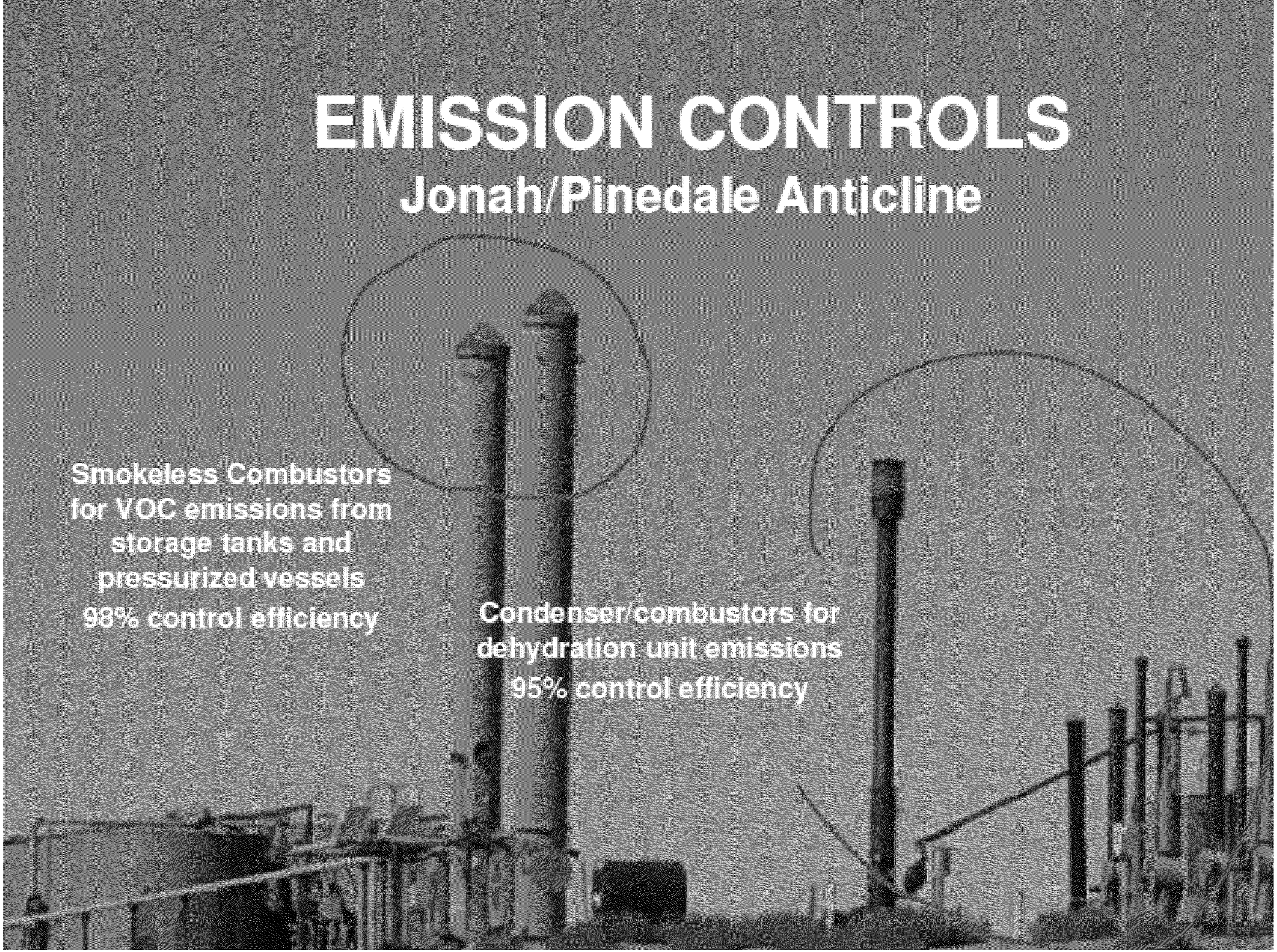


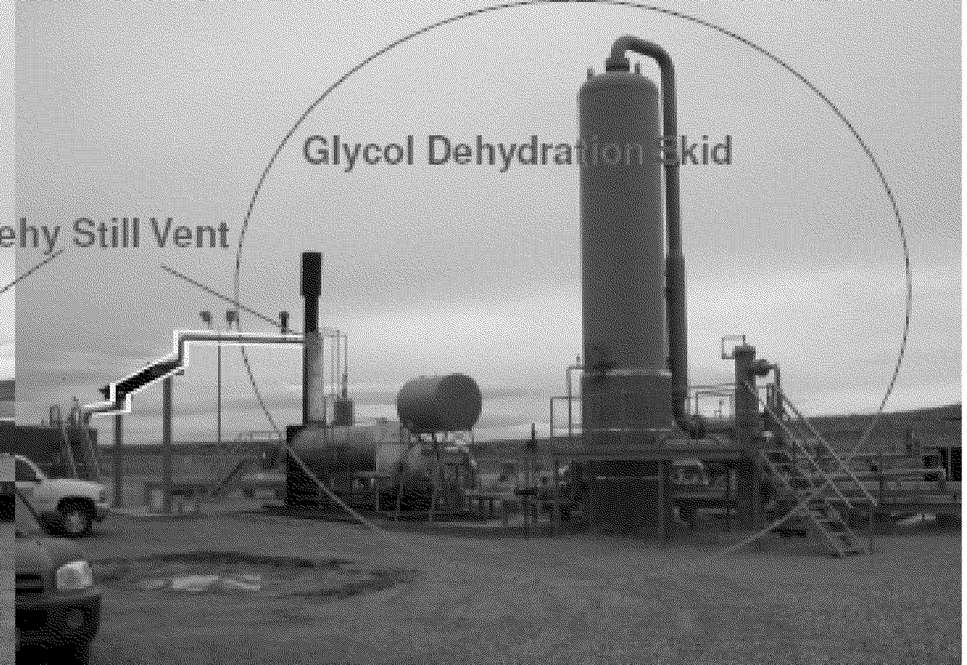
Condensate Tank

Water Tank




NOx & CO Emissions from Hydrocarbon Combustion
Production Unit Natural Gas-Fired Heaters

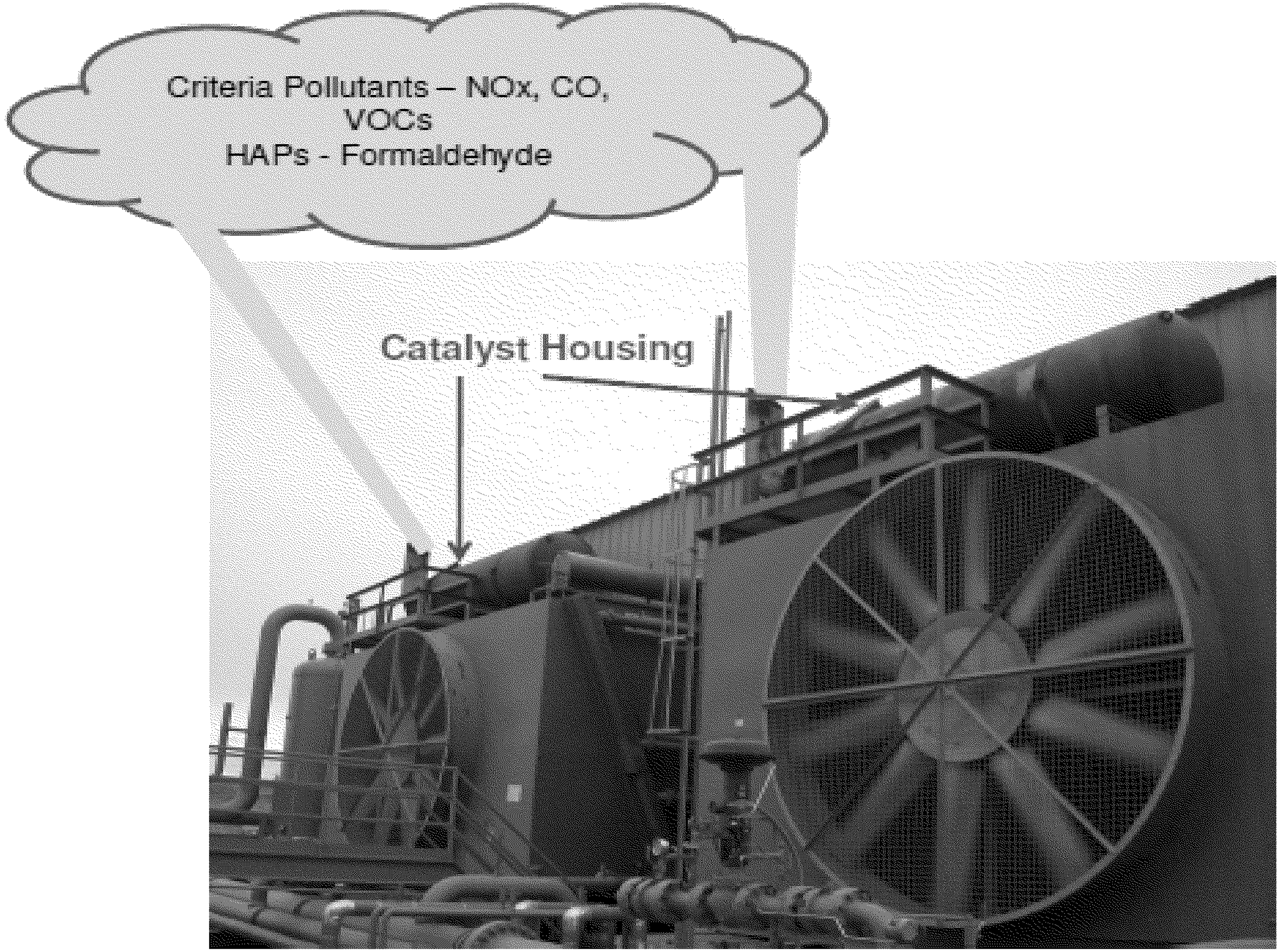

EMISSION CONTROLS
Jonah/Pinedale Anticline
Smokeless Combustors for VOC emissions from storage tanks and pressurized vessels
98% control efficiency
Condenser/combustors for dehydration unit emissions
95% control efficiency



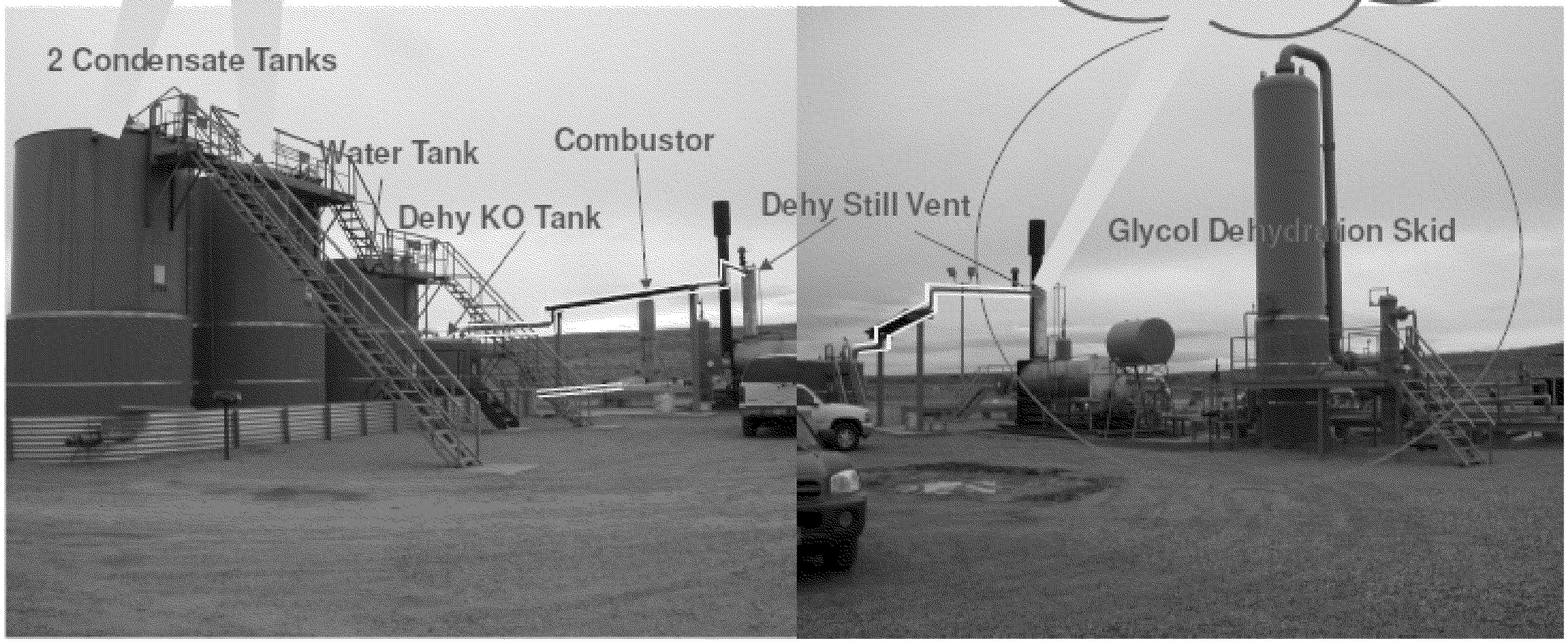
Compressor Station

MACT HH ... glycol dehydrators
MACT ZZZZ ... engines (RICE)
NSPS JJJJ ... engines
NSPS OOOO ... compressors
Title V
PSD

Compressor Skid – Engine Emissions



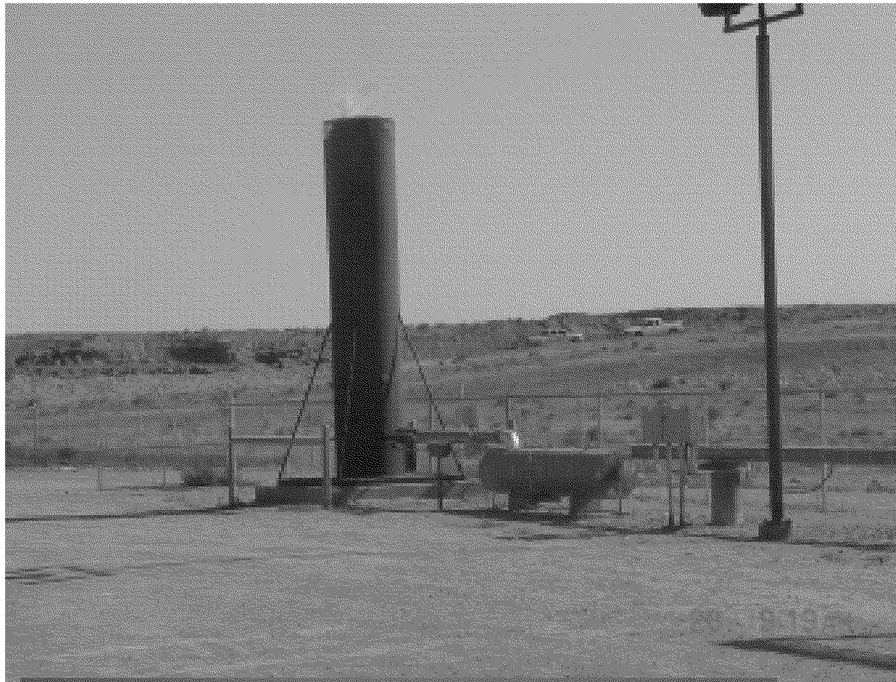
Glycol Dehydrator and Condensate Tank Emissions

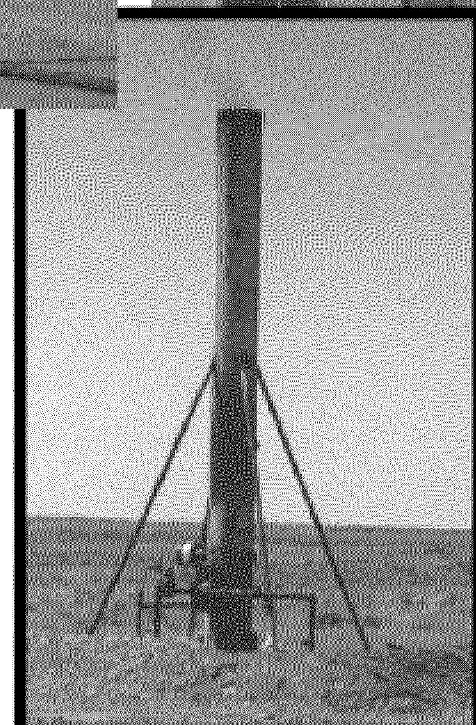


Emissions from glycol dehydrators and from condensate storage tanks are carried through a "Closed Vent System" to the control device (combustor) and is shown above outlined in yellow.

Leaking Closed Vent System (MACT HH)

Enclosed Flare aka Combustor

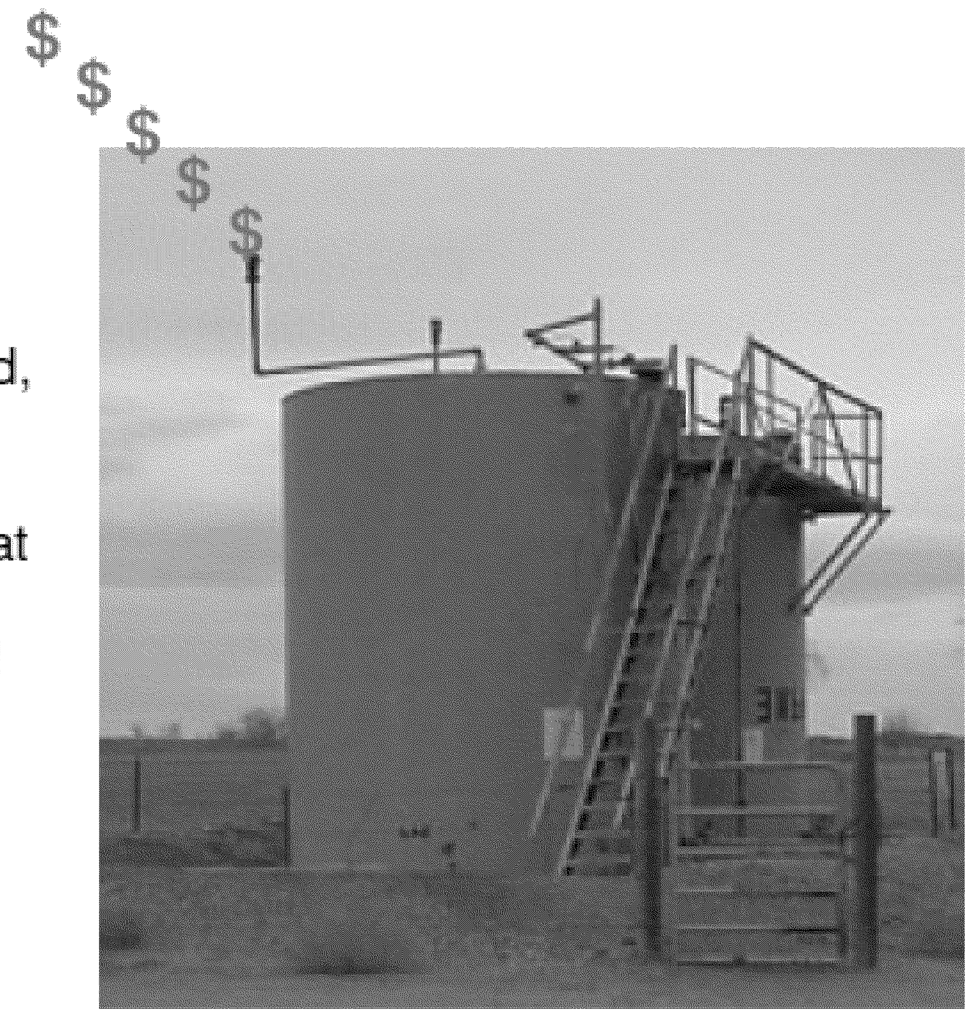





MANUAL
WH
10/14/08 9.05.32PM

Why Let $ Escape Into the Air?

Besides being an environmental hazard, escaping vapors actually cost the operator money. What money?
Uncaptured profits!



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